42. The method of claim 40, wherein supplying energy includes supplying energized particles having energy of less than about 3000eV.

43. The method of claim 40, wherein supplying energy includes supplying energized particles having energy in the range of about 5eV to about 500 eV.

44. The method of claim 40, wherein supplying energy includes supplying energized particles having energy in the range of about 5eV to about 250 eV.

45. The method of claim 40, wherein supplying energy includes supplying energized particles having energy in the range of about 10eV to about 200 eV.

46. The method of claim 40, wherein supplying energy includes supplying energized particles having energy in the range of about 20 eV to about 40 eV.

47. The method of claim 40, wherein forming the second film includes depositing CdS.

48. The method of claim 40, wherein forming the third film includes depositing CdTe.

49. The method of claim 40, wherein forming the second film includes the supplying energy, and wherein the supplying energy includes supplying ionized sulfur.

50. [Amended once] The method of claim 49, wherein forming the second film includes depositing [the] cadmium and reacting the cadmium with the ionized sulfur.

51. The method of claim 40, wherein forming the third film includes the supplying energy, and wherein the supplying energy includes supplying energized ions.

52. [Amended once] The method of claim 51, wherein forming the third film includes depositing

[the] cadmium.

53. The method of claim 40, wherein supplying energy includes supplying ions simultaneously with depositing material from the deposition source.

54. The method of claim 40, wherein supplying energy includes supplying oxygen ions.

55. The method of claim 40, wherein supplying energy includes supplying a noble gas ions.

56. The method of claim 40, wherein the substrate is not heated during forming the second film or the third film.

57. The method of claim 40, wherein forming the semiconductor third film on the semiconductor second film includes depositing a high quality first region and then depositing a second highly doped region on the first region.

58. The method of claim 40, wherein the one of forming the second film and forming the third film includes providing energy to the semiconductor material being deposited by only means sending the semiconductor material toward the cell and by the means supplying energy.

78. [New] A photovoltaic cell made according to the method of claim 40.

79. [New] A photovoltaic cell made according to the method of claim 40, further wherein
the substrate is essentially transparent;
the electrode first film formed on the substrate is essentially transparent;
a semiconductor second film on the electrode first film;
a semiconductor third film on the semiconductor second film; and
an electrode fourth film on the semiconductor third film,
wherein the third film includes a high quality first region adjacent to the second film and a highly

doped second region remote from the second film, and the first region and the second film form a pn junction of the photovoltaic cell.

80. [New] The method of claim 40, wherein the method is performed within a chamber and wherein the chamber has a temperature of less than about 300 degrees Celsius during the depositing of the semiconductor material.

81. [New] The method of claim 40, wherein the method is performed within a chamber and wherein the chamber has a temperature of less than about 250 degrees Celsius during the depositing of the semiconductor material.

82. [New] The method of claim 40, further comprising holding the substrate below about 500 degrees Celsius during the depositing of the semiconductor material.

83. [New] The method of claim 40, wherein the chamber is adapted to hold the substrate below about 300 degrees Celsius during the depositing of the semiconductor material.

84. [New] The method of claim 40, wherein the chamber is adapted to hold the substrate below about 200 degrees Celsius during the depositing of the semiconductor material.

85. [New] The method of claim 40, wherein supplying energy includes supplying energized particles having energy of less than about 5000eV.

86. [New] The method of claim 40, wherein supplying energy includes supplying energized particles having energy of less than about 1000eV.

87. [New] The method of claim 40, wherein supplying energy includes supplying energized particles having energy of less than about 500eV.

88. [New] The method of claim 40, wherein supplying energy includes supplying energized particles having energy of less than about 300eV.

89. [New] The method of claim 40, wherein supplying energy includes supplying energized particles that are focused at the surface where the film is being formed.

90.[New] The method of claim 40, wherein forming the second film includes depositing ZnS.

91.[New] The method of claim 40, wherein forming the second film includes depositing CdZnS.

92.[New] The method of claim 40, wherein forming the second film includes depositing CdO.

93.[New] The method of claim 40, wherein forming the second film includes depositing ZnO.

94.[New] The method of claim 40, wherein forming the second film includes depositing CdZnO.

95.[New] The method of claim 40, wherein forming the second film includes depositing SiC.

96.[New] The method of claim 40, wherein forming the second film includes depositing GaN.

97.[New] The method of claim 40, wherein forming the second film includes depositing InGaN.

98.[New] The method of claim 40, wherein forming the second film includes depositing AlGaN.

99.[New] The method of claim 40, wherein forming the third film includes depositing CuInSe2.

100.[New] The method of claim 40, wherein forming the third film includes depositing InP.

101.[New] The method of claim 40, wherein forming the third film includes depositing GaAs.

102.[New] The method of claim 40, wherein forming the third film includes depositing InGaAs.

103.[New] The method of claim 40, wherein forming the third film includes depositing InGaP.

104.[New] The method of claim 40, wherein forming the third film includes depositing Si.

105. [New] The method of claim 40, wherein the providing the substrate further includes dispensing the substrate from a roll of substrate material.

106. [New] The method of claim 107, further comprising passing the substrate over a curved thermally controlled object.

107. [New] The method of claim 108, wherein the curved thermally controlled object is a rotatable drum.

108. [New] The method of claim 40, wherein forming the third film includes depositing a high-quality region adjacent the second film followed by a highly doped bulk region.

109. [New] The method of claim 40, wherein the electrode first film is substantially transparent, and further comprising

forming first and second conductive leads contacting the transparent second film and the electrode fourth film, respectively, to carry power away from the photovoltaic device.

110. [New] The method of claim 40, wherein forming the second film includes depositing n-type polycrystaline CdS, and wherein forming the third film includes depositing p-type polycrystaline CdTe.

111. [New] The method of claim 112, wherein the second film is about 50nm thick.

112. [New] The method of claim 40, wherein the second film is about 50nm thick.

113. [New] A method of fabricating a photovoltaic device, comprising:

providing a substrate;

forming an electrode first film on the substrate;

forming a semiconductor second film on the electrode first film;

forming a semiconductor third film on the semiconductor second film; and

forming an electrode fourth film on the semiconductor third film

wherein the forming of the second film includes:

depositing semiconductor material using a deposition source; and

supplying energy to the semiconductor material to deposit the semiconductor material into a desired film structure.

114. [New] The method of claim 113, wherein supplying energy includes supplying energized particles having energy in the range of about 5eV to about 250 eV.

115. [New] The method of claim 113, wherein supplying energy includes supplying energized particles having energy in the range of about 10eV to about 200 eV.

116. [New] The method of claim 113, wherein forming the second film includes depositing CdS and forming the third film includes depositing CdTe.

117. [New] The method of claim 113, wherein the providing the substrate further includes

dispensing the substrate from a roll of substrate material.

118. [New] The method of claim 113, further comprising passing the substrate over a curved thermally controlled object.

119. [New] The method of claim 118, wherein the curved thermally controlled object is a rotatable drum.

120. [New] The method of claim 113, wherein forming the third film includes depositing a high-quality region adjacent the second film followed by a highly doped bulk region.

121. [New] The method of claim 113, wherein the electrode first film is substantially transparent, and further comprising

forming first and second conductive leads contacting the transparent second film and the electrode fourth film, respectively, to carry power away from the photovoltaic device.

122. [New] The method of claim 113, wherein forming the second film includes depositing n-type polycrystaline CdS, and wherein forming the third film includes depositing p-type polycrystaline CdTe.

123. [New] The method of claim 113, wherein the second film is about 50nm thick.

124. [New] A method of fabricating a photovoltaic device, comprising:

providing a substrate;

forming an electrode first film on the substrate;

forming a semiconductor second film on the electrode first film;

forming a semiconductor third film on the semiconductor second film; and

forming an electrode fourth film on the semiconductor third film

wherein the forming of the third film includes:

depositing semiconductor material using a deposition source; and

supplying energy to the semiconductor material to deposit the semiconductor material into a desired film structure.

125. [New] The method of claim 124, wherein supplying energy includes supplying energized

particles having energy in the range of about 5eV to about 250 eV.

126. [New] The method of claim 125, wherein supplying energy includes supplying energized particles having energy in the range of about 10eV to about 200 eV.

127. [New] The method of claim 124, wherein the forming of the second film includes depositing CdS and the forming of the third film includes depositing CdTe.

128. [New] The method of claim 124, wherein the providing the substrate further includes dispensing the substrate from a roll of substrate material.

129. [New] The method of claim 124, further comprising passing the substrate over a curved thermally controlled object.

130. [New] The method of claim 129, wherein the curved thermally controlled object is controlled to balance the effect of heat generated on the substrate and films thereon during the deposition.

131. [New] The method of claim 130, wherein the curved thermally controlled object is a rotatable drum.

132. [New] The method of claim 124, wherein forming the third film includes depositing a high-quality region adjacent the second film followed by a highly doped bulk region.

133. [New] The method of claim 124, wherein the electrode first film is substantially transparent, and further comprising

forming first and second conductive leads contacting the transparent second film and the electrode fourth film, respectively, to carry power away from the photovoltaic device.

134. [New] The method of claim 124, wherein forming the second film includes depositing n-type polycrystaline CdS, and wherein forming the third film includes depositing p-type polycrystaline CdTe.

135. [New] The method of claim 124, wherein the second film is about 50nm thick.

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40. [Amended once] A method of fabricating a photovoltaic device, comprising:

providing a substrate;

forming an electrode first film on the substrate;

forming a semiconductor second film on the electrode first film;

forming a semiconductor third film on the semiconductor second film; and

forming an electrode fourth film on the semiconductor third film

wherein one of forming the second film and forming the third film includes:

depositing semiconductor material using a deposition source; and

supplying energy to the semiconductor material to deposit the semiconductor material into a desired film structure.

41. The method of claim 40, wherein supplying energy includes supplying energized particles having energy of greater than about 5eV.

42. The method of claim 40, wherein supplying energy includes supplying energized particles having energy of less than about 3000eV.

43. The method of claim 40, wherein supplying energy includes supplying energized particles having energy in the range of about 5eV to about 500 eV.

44. The method of claim 40, wherein supplying energy includes supplying energized particles having energy in the range of about 5eV to about 250 eV.

45. The method of claim 40, wherein supplying energy includes supplying energized particles having energy in the range of about 10eV to about 200 eV.

46. The method of claim 40, wherein supplying energy includes supplying energized particles

having energy in the range of about 20 eV to about 40 eV.

47. The method of claim 40, wherein forming the second film includes depositing CdS.

48. The method of claim 40, wherein forming the third film includes depositing CdTe.

49. The method of claim 40, wherein forming the second film includes the supplying energy, and wherein the supplying energy includes supplying ionized sulfur.

A2 50. [Amended once] The method of claim 49, wherein forming the second film includes depositing cadmium and reacting the cadmium with the ionized sulfur.

51. The method of claim 40, wherein forming the third film includes the supplying energy, and wherein the supplying energy includes supplying energized ions.

A3 52. [Amended once] The method of claim 51, wherein forming the third film includes depositing cadmium.

53. The method of claim 40, wherein supplying energy includes supplying ions simultaneously with depositing material from the deposition source.

54. The method of claim 40, wherein supplying energy includes supplying oxygen ions.

55. The method of claim 40, wherein supplying energy includes supplying a noble gas ions.

56. The method of claim 40, wherein the substrate is not heated during forming the second film or the third film.

57. The method of claim 40, wherein forming the semiconductor third film on the

semiconductor second film includes depositing a high quality first region and then depositing a second highly doped region on the first region.

58. The method of claim 40, wherein the one of forming the second film and forming the third film includes providing energy to the semiconductor material being deposited by only means sending the semiconductor material toward the cell and by the means supplying energy.

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78. [New] A photovoltaic cell made according to the method of claim 40.

79. [New] A photovoltaic cell made according to the method of claim 40, further wherein
the substrate is essentially transparent;
the electrode first film formed on the substrate is essentially transparent;
a semiconductor second film on the electrode first film;
a semiconductor third film on the semiconductor second film; and
an electrode fourth film on the semiconductor third film,
wherein the third film includes a high quality first region adjacent to the second film and a highly doped second region remote from the second film, and the first region and the second film form a pn junction of the photovoltaic cell.

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80. [New] The method of claim 40, wherein the method is performed within a chamber and wherein the chamber has a temperature of less than about 300 degrees Celsius during the depositing of the semiconductor material.

81. [New] The method of claim 40, wherein the method is performed within a chamber and wherein the chamber has a temperature of less than about 250 degrees Celsius during the depositing of the semiconductor material.

82. [New] The method of claim 40, further comprising holding the substrate below about 500 degrees Celsius during the depositing of the semiconductor material.

83. [New] The method of claim 40, wherein the chamber is adapted to hold the substrate below about 300 degrees Celsius during the depositing of the semiconductor material.

84. [New] The method of claim 40, wherein the chamber is adapted to hold the substrate below about 200 degrees Celsius during the depositing of the semiconductor material.

85. [New] The method of claim 40, wherein supplying energy includes supplying energized particles having energy of less than about 5000eV.

86. [New] The method of claim 40, wherein supplying energy includes supplying energized particles having energy of less than about 1000eV.

87. [New] The method of claim 40, wherein supplying energy includes supplying energized particles having energy of less than about 500eV.

88. [New] The method of claim 40, wherein supplying energy includes supplying energized particles having energy of less than about 300eV.

89. [New] The method of claim 40, wherein supplying energy includes supplying energized particles that are focused at the surface where the film is being formed.

90.[New] The method of claim 40, wherein forming the second film includes depositing ZnS.

91.[New] The method of claim 40, wherein forming the second film includes depositing CdZnS.

92.[New] The method of claim 40, wherein forming the second film includes depositing CdO.

93.[New] The method of claim 40, wherein forming the second film includes depositing ZnO.

94.[New] The method of claim 40, wherein forming the second film includes depositing CdZnO.

95.[New] The method of claim 40, wherein forming the second film includes depositing SiC.

96.[New] The method of claim 40, wherein forming the second film includes depositing GaN.

97.[New] The method of claim 40, wherein forming the second film includes depositing InGaN.

98.[New] The method of claim 40, wherein forming the second film includes depositing AlGaN.

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99.[New] The method of claim 40, wherein forming the third film includes depositing CuInSe2.

100.[New] The method of claim 40, wherein forming the third film includes depositing InP.

101.[New] The method of claim 40, wherein forming the third film includes depositing GaAs.

102.[New] The method of claim 40, wherein forming the third film includes depositing InGaAs.

103.[New] The method of claim 40, wherein forming the third film includes depositing InGaP.

104.[New] The method of claim 40, wherein forming the third film includes depositing Si.

105. [New] The method of claim 40, wherein the providing the substrate further includes dispensing the substrate from a roll of substrate material.

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106. [New] The method of claim 107, further comprising passing the substrate over a curved thermally controlled object.

107. [New] The method of claim 108, wherein the curved thermally controlled object is a

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rotatable drum.

108. [New] The method of claim 40, wherein forming the third film includes depositing a high-quality region adjacent the second film followed by a highly doped bulk region.

109. [New] The method of claim 40, wherein the electrode first film is substantially transparent, and further comprising

forming first and second conductive leads contacting the transparent second film and the electrode fourth film, respectively, to carry power away from the photovoltaic device.

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110. [New] The method of claim 40, wherein forming the second film includes depositing n-type polycrystaline CdS, and wherein forming the third film includes depositing p-type polycrystaline CdTe.

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111. [New] The method of claim 112, wherein the second film is about 50nm thick.

112. [New] The method of claim 40, wherein the second film is about 50nm thick.

113. [New] A method of fabricating a photovoltaic device, comprising:

providing a substrate;

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forming an electrode first film on the substrate;

forming a semiconductor second film on the electrode first film;

forming a semiconductor third film on the semiconductor second film; and

forming an electrode fourth film on the semiconductor third film

wherein the forming of the second film includes:

depositing semiconductor material using a deposition source; and

supplying energy to the semiconductor material to deposit the semiconductor material into a desired film structure.

114. [New] The method of claim 113, wherein supplying energy includes supplying energized particles having energy in the range of about 5eV to about 250 eV.

115. [New] The method of claim 113, wherein supplying energy includes supplying energized particles having energy in the range of about 10eV to about 200 eV.

116. [New] The method of claim 113, wherein forming the second film includes depositing CdS and forming the third film includes depositing CdTe.

117. [New] The method of claim 113, wherein the providing the substrate further includes

dispensing the substrate from a roll of substrate material.

118. [New] The method of claim 113, further comprising passing the substrate over a curved thermally controlled object.

119. [New] The method of claim 118, wherein the curved thermally controlled object is a rotatable drum.

120. [New] The method of claim 113, wherein forming the third film includes depositing a high-quality region adjacent the second film followed by a highly doped bulk region.

121. [New] The method of claim 113, wherein the electrode first film is substantially transparent, and further comprising

forming first and second conductive leads contacting the transparent second film and the electrode fourth film, respectively, to carry power away from the photovoltaic device.

122. [New] The method of claim 113, wherein forming the second film includes depositing n-type polycrystaline CdS, and wherein forming the third film includes depositing p-type

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polycrystaline CdTe.

123. [New] The method of claim 113, wherein the second film is about 50nm thick.

124. [New] A method of fabricating a photovoltaic device, comprising:

providing a substrate;

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forming an electrode first film on the substrate;

forming a semiconductor second film on the electrode first film;

forming a semiconductor third film on the semiconductor second film; and

forming an electrode fourth film on the semiconductor third film

A4 Contd

wherein the forming of the third film includes:

depositing semiconductor material using a deposition source; and

supplying energy to the semiconductor material to deposit the semiconductor material into a desired film structure.

125. [New] The method of claim 124, wherein supplying energy includes supplying energized particles having energy in the range of about 5eV to about 250 eV.

126. [New] The method of claim 125, wherein supplying energy includes supplying energized particles having energy in the range of about 10eV to about 200 eV.

127. [New] The method of claim 124, wherein the forming of the second film includes depositing CdS and the forming of the third film includes depositing CdTe.

128. [New] The method of claim 124, wherein the providing the substrate further includes dispensing the substrate from a roll of substrate material.

129. [New] The method of claim 124, further comprising passing the substrate over a curved thermally controlled object.

130. [New] The method of claim 129, wherein the curved thermally controlled object is controlled to balance the effect of heat generated on the substrate and films thereon during the deposition.

131. [New] The method of claim 130, wherein the curved thermally controlled object is a rotatable drum.

132. [New] The method of claim 124, wherein forming the third film includes depositing a high-quality region adjacent the second film followed by a highly doped bulk region.

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133. [New] The method of claim 124, wherein the electrode first film is substantially transparent, and further comprising

forming first and second conductive leads contacting the transparent second film and the electrode fourth film, respectively, to carry power away from the photovoltaic device.

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134. [New] The method of claim 124, wherein forming the second film includes depositing n-type polycrystaline CdS, and wherein forming the third film includes depositing p-type polycrystaline CdTe.

135. [New] The method of claim 124, wherein the second film is about 50nm thick.